

Having thus described the preferred embodiments, the invention is now claimed to be:

1. A radiation detector module including:

a scintillator (62, 62', 162, 262) arranged to receive penetrating radiation, the scintillator producing second radiation responsive to the penetrating radiation;

a detector array (66, 66', 166, 266) arranged to detect second radiation produced by the scintillator;

electronics (72, 72', 172, 272) arranged on a side of the detector array opposite from the scintillator in a path to receive penetrating radiation that has passed through the scintillator;

a radiation shield (86, 86', 100, 100', 100'', 186, 210, 210', 286, 286') disposed between the detector array and the electronics, the radiation shield being substantially absorbing with respect to the penetrating radiation, the radiation shield including openings (90, 90') communicating between the detector array and the electronics; and

electrical feedthroughs (88, 88', 102, 102', 102'', 188, 212, 212', 288, 288') passing through the radiation shield openings and electrically connecting the detector array and the electronics.

2. The radiation detector module as set forth in claim 1, wherein detector array (66, 66', 166, 266) includes:

back-contact photodetectors each having a second radiation-sensitive side facing the scintillator (62, 62', 162, 262) and an electrical contacting side facing the radiation shield (86, 86', 100, 100', 100'', 186, 210, 210', 286, 286').

3. The radiation detector module as set forth in claim 1, wherein the radiation shield (86, 86', 210, 210', 286, 286') is electrically insulating.

4. The radiation detector module as set forth in claim 1, wherein the radiation shield (86, 86', 100, 186, 286, 286') is electrically conductive and the electrical feedthroughs (88, 88', 102, 188, 288, 288') include:

an electrical conductor (104); and

an insulator (106) electrically isolating the electrical conductor (104) from the radiation shield (86, 86', 100, 186, 286, 286').

5. The radiation detector module as set forth in claim 1, further including:
an insulating support (92) that retains the electrical feedthroughs (88) in an arrangement comporting with an arrangement of the radiation shield openings (90).

6. The radiation detector module as set forth in claim 1, wherein the electrical feedthroughs (88, 88', 102, 102', 102'', 188, 212) are substantially absorbing with respect to the penetrating radiation and cooperate with the radiation shield (86, 86', 100, 100', 100'', 186, 210) to shield the electronics (72, 72', 172) from the penetrating radiation that has passed through the scintillator (62, 62', 162).

7. The radiation detector module as set forth in claim 6, wherein each electrical feedthrough (88, 88', 102, 102', 102'', 188) includes:

a widened portion (94, 94', 194) that spatially overlaps a narrower portion of the corresponding radiation shield opening (90, 90').

8. The radiation detector module as set forth in claim 1, wherein the radiation shield (86, 86', 100, 100', 100'', 186, 210, 210', 286, 286') includes a high-Z material.

9. The radiation detector module as set forth in claim 8, wherein the high-Z material is selected from a group consisting of tungsten, a tungsten alloy, lead, a lead alloy, a lead oxide, bismuth trioxide, tantalum, gold, and platinum.

10. The radiation detector module as set forth in claim 1, wherein the radiation shield (86, 86', 100, 100', 100'', 186, 210, 210', 286, 286') is formed of a composite material including an insulating binder and a matrix of high-Z material.

11. The radiation detector module as set forth in claim 10, wherein the insulating binder is selected from a group consisting of an organic binder, a polymeric material, and an unsaturated polymeric resin.

12. The radiation detector module as set forth in claim 1, wherein each electrical feedthrough (88, 88', 102, 102', 102'', 188, 212) includes:

a high-Z conductor (88, 88', 104, 102', 102'', 188, 212) formed of a high-Z material.

13. The radiation detector module as set forth in claim 12, wherein the high-Z material is selected from a group consisting of tungsten, lead, an alloy of tungsten, an alloy of lead, tantalum, gold, and platinum.

14. The radiation detector module as set forth in claim 12, wherein each electrical feedthrough (88, 88', 102, 188) further includes:

an insulating coating (106) surrounding the high-Z conductor (88, 88', 104, 188).

15. The radiation detector module as set forth in claim 12, wherein each electrical feedthrough (88, 88', 102, 188) further includes:

at least one contact layer (110, 110', 110'', 112, 112', 112'') disposed on an end of the feedthrough that electrically communicates between the feedthrough and at least one of the detector array (66, 66', 166) and the electronics (72, 72', 172).

16. The radiation detector module as set forth in claim 15, wherein the contact layer (110, 110', 110'', 112, 112', 112'') includes a gold layer.

17. The radiation detector module as set forth in claim 1, wherein ends of the electrical feedthroughs (88, 88', 102, 102', 102'', 188, 212, 212', 288, 288') generally align with a surface of the radiation shield (86, 86', 100, 100', 100'', 186, 210, 210', 286, 286') to define a flat surface.

18. The radiation detector module as set forth in claim 1, wherein each radiation shield opening (212') is slanted relative to an incoming direction of the penetrating radiation (214) to prevent the penetrating radiation (214) from passing through the opening (212').

19. The radiation detector module as set forth in claim 1, further including:

a second radiation shield (286') disposed between the detector array (266) and the electronics (272), the second radiation shield (286') being substantially absorbing with respect to the penetrating radiation;

second electrical feedthroughs (288') passing through openings of the second radiation shield (286'), the second electrical feedthroughs (288') being spatially offset respective to the

first electrical feedthroughs (288) that pass through openings of the first radiation shield (286) to prevent penetrating radiation from reaching the electronics (272); and

electrical connectors (294) connecting selected electrical feedthroughs (288) and second electrical feedthroughs (288') to electrically connect the detector array (266) and the electronics (272).

20. A computed tomography scanner (10) including:
 - a stationary gantry (12);
 - a rotating gantry (22) rotatably connected with the stationary gantry (12) for rotation about an axis of rotation;
 - an x-ray source (14) mounted to the rotating gantry (22) for projecting a cone-beam of radiation through the axis of rotation;
 - a tiled array (30) of detector modules (60) as set forth in claim 1 disposed across the axis of rotation from the x-ray source (14); and
 - a reconstruction processor (42) for processing an output of the electronics (72) into an image representation.

21. A method for detecting penetrating radiation traveling in a first direction, the method comprising:

in a planar region having a front face transverse to the first direction, converting most of the penetrating radiation into a second radiation;

passing the second radiation and a remainder of the penetrating radiation from a second face of the planar region;

converting the second radiation into electrical signals;
electrically communicating the electrical signals via feedthroughs (88, 88', 102, 102', 102'', 188, 212, 212', 288, 288') in a radiation shield (86, 86', 100, 100', 100'', 186, 210, 210', 286, 286') disposed behind the second face of the planar region to electronics (72, 72', 172, 272) disposed behind the radiation shield while absorbing the remainder of the penetrating radiation with the radiation shield.

22. The method as set forth in claim 21, wherein the absorbing of the remainder of the penetrating radiation further includes:

absorbing penetrating radiation with the feedthroughs (88, 88', 102, 102', 102'', 188, 212) to prevent the penetrating radiation from reaching the electronics (72, 72', 172).

23. The method as set forth in claim 21, further including:

extruding the radiation shield (210, 210') with the feedthroughs (202, 212, 212') embedded therein.

24. The method as set forth in claim 21, further including:

arranging the feedthroughs (212', 286, 286') in the radiation shield (210', 286, 286') such that the penetrating radiation is prevented from passing through the feedthroughs (212', 286, 286') or between the feedthroughs and the shield.